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AUTHOR Cropley, A. J.
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ABSTRACT

Recent developments in computer technology are reducing the limitations of computers as mass communication devices. The growth of remote teleprocessing is one important step. Computers can now interact with users via terminals which may be hundreds of miles from the actual mainframe machine. Many terminals can be in operation at once, so that many users may communicate with the central processing unit (CPU) simultaneously. Furthermore, computer languages are being developed which are peculiarly suited to such remote teleprocessing, and which permit communication in language closely resembling conversational English. The user can also ask supplemental questions and receive individualized answers. Thus, the computer's information is becoming available to any user who has access to electricity. Finally, costs are being sharply reduced by organizational systems like commercial time-sharing or establishment of user consortiums. Currently, work is going forward on a device which will make the transistor seem as bulky as the tube. This and other developments make the future of computers in mass communications enormous. (Author/JK)

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Computers, remote teleprocessing and mass communication

A. J. Cropley, Assoc. Prof of Psychology, University of Saskatchewan.
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Division III

Mass communications have grown through increasing use of technology, and the computer is possibly the pinnacle to date of this growth process. Computers have a role in mass communications even as basic information-processing tools; for example, recent developments include use of computers to analyze opinion poll, open-ended responses. The computer is also a valuable information-storage device, as users now need access to information beyond the span of individual memory. In medicine, this usage has reached the point of computers serving as diagnostic consultants to practising physicians. Finally, the computer serves mass communications through computer-assisted instruction, which is now well established in schools and in medicine, dentistry, the Armed Forces, and so on.

Computers have several limitations as mass communications devices, however, including limitations on memory size, restricted accessibility to simultaneous audiences, and geographical and economic limitations on availability. Recent developments are reducing these shortcomings -- the present paper is concerned with growth in audience size and with reductions in geographical and economic barriers to mass communication via computer.

The growth of remote teleprocessing is one important step. Computers can now interact with users via devices (terminals) which may be hundreds of miles from the actual mainframe machine. Many terminals can be in operation at once, so that many users may communicate with the "brain" simultaneously. Furthermore, computer languages are being developed which are peculiarly suited to such remote teleprocessing, and which permit communication in language closely resembling conversational English. The user can also ask supplemental questions and receive individualized answers unlike newspapers, radio or TV. Thus, the computer's information is becoming available to any user who has access to electricity. For example, a Navajo tribe in the USA and Eskimos in the Canadian Arctic are on line to central computers as far as 2,800 miles away, via teleprocessing. Finally, the cost factor is being sharply reduced by organizational systems like commercial time-sharing, or establsihment of user consortiums as has been done in Kansas, for example.

The actual prospects are probably as difficult to predict exactly as the growth of television when network broadcasting began in 1928. However, for example, devices with the capacity to make the transistor as bulky and obsolete as the tube are currently under development, while actual mass teleportation by computerized break down of matter into radio-actively labelled molecules is in the early stages of development in Canada. Thus, the future of computers in mass communications, and their effects on mass communications are probably enormous .

A. J. Cropley, Department of Psychology, University of Saskatchewan
Regina Campus, Regina, Saskatchewan, Canada. S4S OA2.

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Computers, remote teleprocessing, and mass communications

A. J. Cropley

University of Saskatchewan Regina Campus

Purpose of the paper

In mass communications, a given message is circulated to a large number of people more or less simultaneously with the aid of various special devices and techniques, to summarize Schramm's (1960) description of the process. Essential to this process is, of course, the existence of devices or systems capable of delivering information to such large audiences and of having access to the members of the audience at the one time. Thus, the rise of mass communications has gone hand in hand with the growth of communications technologies capable of supporting this basic model, from the simple 'technology' involved in the use of paper and ink in China in the first century to the emergence of printing in the fifth century, movable type in the sixteenth, and the explosion of the nineteenth which saw the appearance of stereotype printing, photography, Morse code telegraphy, telephones and wireless (Schramm, 1960). The present century has seen the emergence of network broadcasting and the growth of television, and now, the emergence of the computer. Thus, the growth of information technology has been a key to the advancement of mass communication, while the computer is the pinnacle (to date) of the technological growth process. What then can the computer contribute to the area of mass communications?

Can it facilitate growth beyond what has been seen to date through the use of existing mass media like radio, TV, newspapers and so on? These questions constitute the issues with which the present paper is concerned.

Conventional information functions of the computer

The first basic use of the computer in information handling settings is as an information-storage and retrieval device. In this use it can (although inadequately) be conceptualized as a very special kind of library or even as a book (Super, 1970), with an unusually elaborate indexing system. Within this library-oriented model, the computer can store large quantities of indexed material and then retrieve it according to various indexing systems, or even summarize data during the retrieval process, in some such systems. Appropriate use of key words and similar devices makes it possible for the particular array of information to be particularly individualized to the needs of each individual user. In medicine, for example, the information-retrieval function of the computer is being developed to a very high degree, with computers acting as diagnostic consultants to individual practising physicians (Miller & Harless, 1970).

A second, related use of the computer is as an information-processing tool. With rapid growth of data collection, access is needed to arrays of information which, in their raw

state, are beyond the span of individual memory (Burrow, 1969). The computer can be used to assemble, organize, and analyze masses of scattered, apparently discrepant, or simply unorganized information into usable data within the capacity of human users to read, store and utilize. This frequently involves carrying out complex statistical analyses which might otherwise be virtually impossible. In the area of mass communications, another specific example involves the use of computers to analyze responses obtained in opinion polls, even when the responses are to questions of the open-ended rather than check-off kind. Frisbie and Sudman (1968), for example, have reported some success with the "General Inquirer" system, which analyzes natural language responses to opinion polls.

A third role of the computer in communications involves the machine's function as a <u>supervisory and control device</u>, a situation in which the computer regulates the function of other communications devices without itself actually being the instrument of communication. Examples of this function include computer control of traffic lights in which information about the flow of traffic is transmitted to motorists, computerized telephone switching operations in which the flow of telephone messages is regulated by the machine, and computer-controlled typesetting, in which input to the system at the wire service end may actually be in a coded form, so that what is received is not a message 'in clear' for human setting, but

a series of impulses that go straight to the computer which then sets type in natural language.

Individualization of communications

In all three of the functions discussed to date, a major aspect of the computer's participation lies in its ability to make decisions according to the particular needs of a specific situation. Thus, traffic may be re-routed by a new route never before conceptualized by a human controller, on the basis of a unique atypical pattern of flow, a set of unexpected cross-categories in responses may be established by the computer through its attention to characteristics of a questionnaire not apparent to human analysts until the computer indicates their existence, or the particular set of library references retrieved in response to a set of key-words may be idiosyncratic to a particular user. A crucial property of computers, in fact, is their ability to make decisions and modify their responses to a particular user on the basis of his peculiar needs, a property which is not seen in other communications devices like radio, TV or newspapers. This decision-making property has been developed to the point of computer-controlled vocational and educational guidance systems (Super, 1970).

Because of its ability to make decisions and re-organize its own responses, the computer has begun to have widespread application in the area of education, chiefly through computer-assisted instruction. This function is now

well-established, not only in public schools where it has found widespread application, but in the teaching of medicine (Miller & Harless, 1970) and dentistry (Podshadley, 1970), and in the Armed Forces (Hitchens, 1970).

Limitations of the computer

However, none of these applications of computers involves a strictly mass communications function. Mass communications is typically seen (e.g., Schramm, 1960) as involving simultaneous transmission of a particular message to a large audience who may be scattered geographically at the time -- in the computer applications discussed to this point the element of simultaneous transmission of the message to a large audience is missing, as is that of widespread availability of access to the computer. In the usual situation, the computer is in communication with a very limited number of users, and even these people are selected on the basis of being located in close proximity to the place in which the computer is housed. The computer lacks the mass aspect of mass communications which is achieved through making contact with a large, scattered audience. At the best, the functions already discussed involve the computer's ability to facilitate mass communications, not to be their medium.

Teleprocessing

The growth of teleprocessing may well be the key

step which gives the computer true mass communications potentials. In remote teleprocessing, the user is linked to a central computer by a terminal device, which may be in the form of a typewriter keyboard, a cathode ray tube, a ticker-tape device, and so on. The terminal and the computer may be many hundreds of miles apart and linked, for example, by telephone wires; an example of this kind of geographical separation is seen in a project in which students in Regina, Saskatchewan were linked to a mainframe computer in Edmonton, Alberta, 434 miles away. In fact, Eskimos in Inuvik in the Canadian Arctic are now linked to the University of Western Ontario, 2800 miles away, while a Navajo Band in the USA is receiving computer services via remote terminals. Large computers are capable of maintaining contact with many users simultaneously, each user being able to ignore the fact that he is sharing the machine's attention at a given time, so prompt are its responses to him.

Advantages of the computer

Furthermore, the computer has certain capacities which are completely denied or at best only partially available in the case of other modes of communication. Communication via computer has, in fact, a number of such advantages -- it can receive feedback from a user and modify the information flow to him on the basis of that feedback, it can compare his responses with a list of anticipated responses and respond

appropriately or handle unexpected responses effectively, it can refer a user to other sources of information according to his particular needs, and so on. The computer has the capacity to make the information exchange process extremely idiosyncratic to a particular recipient, and thus to individualize mass communications in a way which is inconceivable with other media. Furthermore, because of this, it is also capable of changing the whole basic idea of mass communications in which, for example, everybody gets the same message at the same time, whether it is a good time or not. The vision of newscasts in which a person uses his 15 minutes to focus on areas which interest him, or to brush up in detail on a given area, and so on, prompts an interesting vision of individualized mass communications, despite the apparent terminological inconsistency. If the control function of the computer is also taken into account, so that a variety of communications devices could be co-ordinated via the terminal (e.g., TV screens, film clips, microfilms in the City Library, and so on), the picture becomes extremely provocative.

The ultimate in this process of envisaging a computer-modified system of mass communications involves research into mass teleportation which is currently under way in Canada. In mass teleportation, actual objects (or even conceivably people) are transported via particle flows and

energy modulation such as is seen in TV or radio or telephone, and so on. One system which may permit this apparently science-fantasy dream involves breaking down the mass to be teleported into its constituent molecules with the aid of an electron microscope, labelling the molecules with radio-active isotopes, storing the whole blueprint in a computer's memory, and then transporting the disassembled molecules under computer control to an assembler in some location remote from the transmitter, and finally reversing the breakdown process. Think of the effects of that on mass communications!

Language and cost problems

Unfortunately, while the systems just discussed are technically feasible, or even completely operational in the earlier instances, there are some problems. Of these, cost is of major importance. Furthermore, difficulties in making the contact between user and machine maximally interactive, and capable of being carried on in as near as possible to natural language arise. The interaction with the machine must clearly be intelligible to the user, in fact, and couched in a comprehensible interactive language. Unfortunately, very large-scale remote teleprocessing systems such as are conceptualized here are only capable of being supported by very large, expensive computers, despite the fact that quite small machines do have limited teleprocessing capacities, while early

computer languages are strikingly dissimilar from natural language, and intelligible only to the experts. However, some expedients which help to reduce costs are available, while technological advances in both hardware (equipment) and software (computer languages) have great promise for handling the second problem.

Language of interaction

Many programming languages are available for use in remote teleprocessing (Frye, 1969). However, a fairly recent arrival on the scene has great promise -- this is the language known as APL (Iverson, 1962), which has been described as the perfect user's language (Hunka, 1967). For the present purposes, APL is exceptionally capable of supporting conversational interactions with a user. Natural language is readily used for giving and receiving messages, while no strict formats have to be observed. A wide variety of branches and loops can be made available to the user, while the machine can be given the capacity to make a variety of appropriate responses to a user's requests or responses, so that it does not simply repeat stock phrases over and over again. (These kinds of functions are all available in other languages, of course, and are not exclusive to APL. However, that language is especially convenient and quick, and therefore cheap to use.)

Cost saving -- the computer network

Large teleprocessing systems are extremely expensive, and require very large audiences to justify their cost. At first glance, this seems to rule out teleprocessing by small organizations or by individual people. However, a single computer configuration can be jointly used by a number of users through what is known as "time sharing." This process may take the form of a consortium of users sharing the costs among themselves to provide themselves with computer services. On the other hand, time sharing can also be achieved by renting time from a commercial time-sharing company, of which there are in excess of 100 in North America (Hamblen, 1971). These companies own the equipment and rent time on it to their customers. Thus, there arises the image of huge computer "network" companies renting time to users, in much the same way as radio and TV networks do now, and the associated picture of millions of "receiving sets" (remote terminals) in people's homes, linked to the network much as radio and TV sets are linked to the networks now. The home receiver could be in the form of a TV tube, or typewriter terminal, or even a tailor-made, printed-on-the-spot newspaper. However, the computer audience would have much more flexibility and choice in what they received on their "sets," since each "program" could be attuned to the individual user. Such a prediction of future developments in mass communications involves a great deal of relatively

free extrapolation from present circumstances. However, the credibility gap can hardly be larger than would have existed if modern network TV developments had been predicted in 1928 when the first network broadcasting began.

Psychosocial factors

One issue which arises in any such vision of mass communications innovation through remote computer teleprocessing involves the human factors in the man-machine interaction. Practical experience (e.g., Cropley & Gross, 1970) suggests that people do not find working with a machine powerfully alienating in all cases. Nonetheless, the questions arise of whether everybody can tolerate the man-machine interface equally well, or whether the design of the interface should be the same for all users. The key question is that of what people (if any) will find expanded contact with computers unpleasant or intolerable and what kind (if any) will like it. The answer to this question will have enormous ramifications for the matter of how realistic it is to envisage a computer mass communications network and of just how the point at which man and machine actually confront each other could be designed to facilitate human enjoyment and use of the contact. A research project along these lines is currently being funded by the Canadian Government's Department of Communications.

Summary

Not only growth in computer speed and core size, but also developments in the field of teleprocessing can be conceptualized as moving toward a position in which the computer can assume a new role, in which it is truly an instrument of mass communications. Hardware advances are facilitating contact with large, geographically-remote audiences, while software advances are moving toward communication in natural language. The network concept suggests that cost barriers could be eliminated, while the potential of the computer for individualizing what has previously been, by definition, a non-individualized process suggests that development is worthwhile. Thus, the computer looks to have the potential to permit development of a new kind of mass communications network.

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